International Journal of Food Science & Technology (IJFST)
Vol. 12, Issue 1, Jun 2022, 17–26
© TJPRC Pvt. Ltd.

TRANS STELLAR
•Journal Publications •Research Consultancy

Original Article

EVALUATION OF FUNCTIONAL AND PHYSIOCHEMICAL PROPERTIES OF BANANA PEEL AND PREPARATION OF HERBAL TEA USING THE PEELS, ASWAGANDHA AND TULSI

MISHRA VARNIKA[1] & MISHRA SUNITA[2]

[1]*Student of M.Sc. Food Science and Technology, Department of Food Science And Nutrition, School for Home Science, Babasaheb Bhimrao Ambedkar University, A Central University, Lucknow, Uttar Pradesh, India*

[2]*Professor and Dean, Department of Food Science and Nutrition, School for Home Science, Babasaheb Bhimrao Ambedkar University, A Central University, Lucknow, Uttar Pradesh, India*

ABSTRACT:

The current study investigates banana peel and its physical, chemical (dry matter, fat and ash content, acidity, pH, water and oil holding capacity and colour), mineral content (Ca, K, Na, P, S, Mg, Fe, Mn, Zn and Ni) and phytochemical screening. Fiber-rich banana pieces were found to contain 66.8 g of total dietary fiber per 100 g, of which 58.6 g were insoluble dietary fiber per 100 g, while 8.2 g were soluble dietary fiber per 100 g; from these findings it can be inferred that banana peel is a good source of dietary fiber that can be used in food production. The high level of minerals helps battle against insomnia and calms down the nervous system. Also an herbal tea was prepared to check the acceptability of banana peel in Aswagandha and Tulsi tea. For this the two samples (T1 & T2) were evaluated by 10 community members on 9 point hedonic scale and T2 was found more acceptable which contains mixture of aswagandha, tulsi, banana peel, cloves, cinnamon, ginger and honey. All these ingredients are rich in antioxidants, enhances energy, helps the body to relax, aswagandha has anti-ageing properties while tulsi helps in maintaining cortisol hormaione level and has medicinal properties. Such ingredients are beneficial during the time of global pandemic due to Corona virus and in some way helps in boosting immunity.

Key word: Mineral Content, Chemical, Phytochemical screening, Banana peel, Herbal tea,

Received: Mar 12, 2022; **Accepted**: Apr 02, 2022; **Published**: Jun 03, 2022; **Paper Id**: IJFSTJUN20223

INTRODUCTION

Banana is a plant species that develops in tropical and temperate areas and is one of the world's most important food sources **[1, 2]**. Banana is from the family Musaceae, of genus Musa. These are one of the most produced fruits in the world, and are widely cultivated in some nations. According to data released, the worldwide registered outputs of Bananas were approximately 117.9 million tonnes**[3]**. Banana contains potassium, Vit.A, Vit.C, Vit.B6, dietary fiber and various antioxidant and bioactive compounds. It has high therapeutic value, low fat, low salt and cholesterol content. Being a tropical fruit it protects itself from oxidative stress by increasing antioxidant levels **[4]**. Banana peel accounts for 40 per cent of the fruit ends up as a waste product and is typically underused **[5]**. This has become an environmental problem which causes industrial damage. Therefore, the use of these residues in industry becomes important as there, the current destination is related to insufficient environmental issues as well as Economic losses **[6]**. Some scholars have pointed out the value of Banana peel to be used in the food industry because of its substantial compound and Nutrient value **[7]**. Meanwhile there is an increasing interest in natural

usage Sources of fruit-bearing dietary compounds combined with comfort of Functional grocery. This is the result of the creation of food products enriched with fruit peels **[8].** Banana peel is also abundant in antioxidants, such as ascorbic compounds acid, tocopherol, beta-carotene, dopamine, phenolic group and gallocatechin**[4].**

Therefore, the aim of this study was to check the physiochemical and functional properties of banana peels as well as developing a product using banana peel. An herbal tea was prepared using banana peel, aswagandha roots and tulsi leaves. Due to the presence of potassium, magnesium, vit.B6 and antioxidants banana peel can be used in infusion of herbal tea, while tulsi(Ocimum tenuiflorum) contains essential oils, which have eugenol, carvarol, methyl-chavicol and caryophylline**[9].** It is beneficial for cure of cold, fever, acidity and lassitude. Aswagandha (Withanea somnifera) is helpful in enhancing nervous system and brain, acts as adaptogen and boost immunity.

MATERIALS AND METHODS

All the required materials were purchased from local market of Lucknow city. The experiment was performed in 2019-2020 at USIC lab of Babasaheb Bhimra Ambedkar University, Lucknow, Uttar Pradesh, India and at Research Laboratory of Department of Food Science and Nutrition, School for Home Science, BBAU, Lucknow.

Preparation of Raw Materials

The ripe banana peel was peeled off after dipping the fruit (2 kg) in water and rinsed. 2 mm thick, peel slices were submerged in a 10 minute solution of citric acid (by mass per volume), washed and dried at 60 ° C for 6 hours to minimize the enzymatic browning. Peel slices were milled after draining and drying to generate powder. Both forms were packed in impermeable plastic shopping bags for later study, and kept at 18 ° C. Flour content was obtained by dividing the amount of meal provided by the quantity of ripe banana utilized, and the results were reported as g of meal per kilogram of banana. All the required materials used in herbal tea development was also dried and stored in powdered form.

Physical and Chemical Quality of Banana Peels Powder

Gravimetric heating ((140±2) ° C for 2 h) and 2 g of sample were used to assess moisture. Normal methods were used to analyze ash, while a pH meter was used to assess flour pH. suspension (10% by weight per volume) was agitated for 5 minutes, held for 30 minutes and purified. The pH of the filtered mixture was determined, and according to Fagbemi, the viscosity of the flour samples was estimated. Ripe banana flour was spread in water at 8 per cent (by weight per volume) utilizing a magnetic stirrer (1000 rpm) and warmed from 40 to 90° C in a shaking water bath and held for 20 minutes at this temperature. Viscosity calculation was executed using digital viscometer, colorimeter was used to track flour colour. Volume fractions of insoluble dietary fiber and soluble dietary fiber have been tested using the test **[10]**. The total dietary fiber was the amount of soluble and insoluble dietary fiber. The cumulative starch was calculated by employing the test **[11]**.

According to Bunzel et al., the total phenolic content of ripe banana peel meal was determined **[12]**. A mass of flour was around. 0.8g of the sample was applied to 50 mL of NaOH aqueous solution (1 mol / L) in dark vacuum at 25 ° C during 18 h. Adding 9.5 mL of HCl (pH<2) has improved the acidity of this mixture. The mixture was then centrifuged at 10 000 g (6 ° C) for 15 minutes. Maximum phenolic content was measured using the Folin-Ciocalteu test **[13]**.

Capacity to Carry Water and Oil

A 25 mL volume of purified water or industrial olive oil was blended with 1 g of dry sample. The solution was poured and incubated for 1 h at 20, 40, or 60 ° C. For 20 minutes, tubes were centrifuged at 10000rpm and the supernatant was then poured out. After that, the tubes were emptied by positioning them at an angle of 45 ° for 10 min. Weighed the residue and measured water holding capacity (WHC, in g water per 100 g of sample) and oil holding capacity (OHC, in g oil per 100 g of sample) **[1].**

Chemical Composition

The moisture, ash, crude fat, crude fiber and protein content of sample were calculated using the AOAC methods (1995). The moisture content of the sample was determined by oven drying (FANEM dryer, model 315SE, Brazil) at 105 ° C to constant weight (method 925.10), while ash was determined at 550 ° C to constant weight by incineration of the samples in a muffle (method 923.03).Crude fat was measured using the Soxhlet process accompanied by evaporation to constant mass and a conversion factor of 6.25 was used to measure protein using Kjeldahl process. According to the Adolfo Lutz Institute (IAL, 2008), crude fiber was measured using the non-enzymatic gravimetric method (method 044 / IV) and carbohydrate was calculated by difference. Both analyzes were performed in duplicate, and the findings were expressed as g/100 g sample.

Phytochemical Compound Screening

For conventional photochemical screening, the photochemical derivatives were performed in the methanol, ethanol, acetone, and NaCl aqueous solution extract**[14,15]**.

Flavonoid Detection

In a test tube, magnesium ribbon and a few drops of concentrated HCL have been applied to 2 ml of extracts, pink or red suggests the existence of flavonoids.

Carbohydrate Identification by Molish Test

Boiled 2 ml of Molish reagent and 2 ml of extracts, and then added few drops of sulphuric acid from the sides of the test tube. A red color ring signals the presence of carbohydrates.

Reducing Sugar Detection

5 ml of extract were applied with 5ml of boiling Fehling's solution for 2-5min. A brick red precipitate identifies the existence of reduced sugar.

Tannin Detection

2 ml of extracts were placed into a test tube and a few drops of 0.1 percent or 1 m of ferric chloride were applied. A coloration of black or greenish black suggests the presence of tannin.

Saponins Detection

Foam test: Extract 2 ml was shaken in a test tube with 5 ml of distilled water. If foam persists for 10 minutes, it suggests presence of saponin.

Anthraquinones Detection

2 ml of extract with 2 ml of hydroxide ammonium solution added. A strong, pink color suggests anthraquinone existence.

Steroids Detection

2 ml of extract, 2 ml of chloroform, 2 ml of acetic acid and 1 ml of sulfuric concentrated acid. A blue-green color shows steroid existence.

Alkaloids Detection

Wagner test: 2 ml of extract processed with little drops of Wagner's reagent. Brown or reddish precipitate formation suggests existence of alkaloids.

Glycosides Detection Through Modified Bronstrager's Test:

Extract was mixed with a solution of 0.1 percent or 1 m of ferric chloride and submerged for 5 minutes in boiling water. The mixture was then cooled and benzene was added in equal amount. The benzene surface was then removed into another test tube and handled with a solution of ammonia. Rose-pink color production in the ammonia layer suggests the existence of anthranol glycosides.

Phytosterol Detection

Extracts of 2 ml have been treated with 5 ml chloroform and filtrates. Then the filtrates were handled and allowed to stand with few drops of concentrated sulfuric acid shaken. The golden-yellow appearance suggests the presence of phytosterol. Check with Libermanburchard: 2 ml of extracts have been treated with 5 ml of chloroform and filtrates. Instead, added a few drops of anhydride and boiled acetic acid. A few drops of sulfuric acid concentrate added. Brown ring formation at the feature suggests the existence of phytosterol.

Phenols Detection Through Ferric Chloride Test

2 ml of extract was treated with a solution of 0.1 percent or 1 m of ferric chloride 3-4 drops. Bluish black coloration suggests the existence of phenols.

Terpenoides Determination

2 ml of extract was processed with 2 ml of chloroform, then 3 ml of or a few drops of sulphuric acid were applied. Radish brown coloration in the inter-face suggests terpenoid existence.

Preparation of Herbal Tea

The required materials were Aswagandha, Banana peels, Tulsi, Ginger (1 tsp), green cardamom (2/4 tsp), cloves (2/4 tsp), pinch of black pepper and honey. For preparation, 300ml water was boiled for 2-3 minutes then all the ingredients were added in according to the set ratios. After boiling for 10 minutes on simmer, strain and add dash of honey and lemon juice.

The experiment included two infusions- T1 (Aswagandha and tulsi) in a ratio 70:30 while T2 has aswagandha, tulsi and banana peel (50:25:25). For sensory evaluation 9-point hedonic scale were used by 10 community members on the basis of four parameters- aroma, taste, color and overall acceptability. Average and standard deviation was calculated of both the samples for overall calculation. The standard deviation formula is-

$$s = \sqrt{\frac{\Sigma(xi-\bar{x})^2}{n-1}}$$

Where, stands for standard deviation, x_i is the data values $\bar{x}$ is the mean value while n is the number of values in data set.

RESULTS AND DISCUSSIONS

Mean yield of ripe peeling banana flour was calculated to be 50 and 200 g/kg. The powdery flour was obtained maximum in peel. Table 1 reveals the total composition of the banana flour.

Table 1: Proximate Analysis of Banana Peel

Analysis	Ripe Banana Peel Powder (g/100gm)
Dry matter %	71
Fat %	0.15
Ash %	0.27
Acidity / SH	3.78
pH	6.01

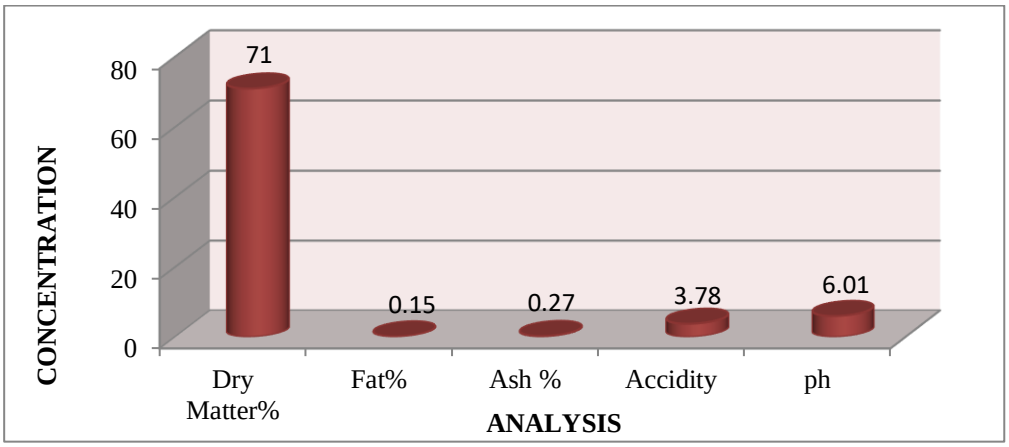

Figure 1: Representation of Proximate Analysis of Banana Peel.

The result shows that banana peels have largest volume of dry matter (figure 1).

Physical and Chemical Properties of the Flour Samples

For composition analysis of the meal samples derived from ripe banana peel powder moisture, colour, total phenolic, ash and fat content, WHC and OHC were determined and viscosity and overrun were tested for physical characteristics (Table 2). It was found that ripe banana peel flour has higher moisture content (11.06 percent).

Table 2: Chemical and Physical Properties of Ripe Banana Peel

Parameter	Ripe Banana Peel Flour
Dry matter (%)	11.09
Ash (%)	4.03
pH	4.14
Viscosity / (Pa-s)	4.2
L*	38.08
a*	5.21
b*	20.6
SDF (%)	83

IDF (%)	50
TDF (%)	67
Total starch / (%)	**62**
WHC 40	4.01
WHC 60	4.52
WHC80	5.87
OHC40	0.39
OHC60	0.61
OHC80	1
Total phenolic /(g/100g)	**0.9**
L*=lightness, b*=blueness(-), a*=redness(+),OHC=oil holding capacity (g of oil per g of sample at 40,60 and 80°C), SDF=soluble dietary fiber, TDF=total dietary fiber, WHC=water holding capacity (g of water per g of sample at 40, 60 and 80°C, IDF- insoluble dietary fiber.	

Mineral Concentration

Table 3 shows the mineral concentration of banana peel powder. In the mineral analysis report represented in the following table potassium (1500) was found to be in high concentration in banana skin followed by phosphorus and calcium as shown in figure 3.

Table 3: Mineral Concentration in Banana Peel

Minerals (mg/kg)	Banana Powder (g/100g)
Ca	730
K	1500
Mg	108
P	932
Na	271
Fe	45

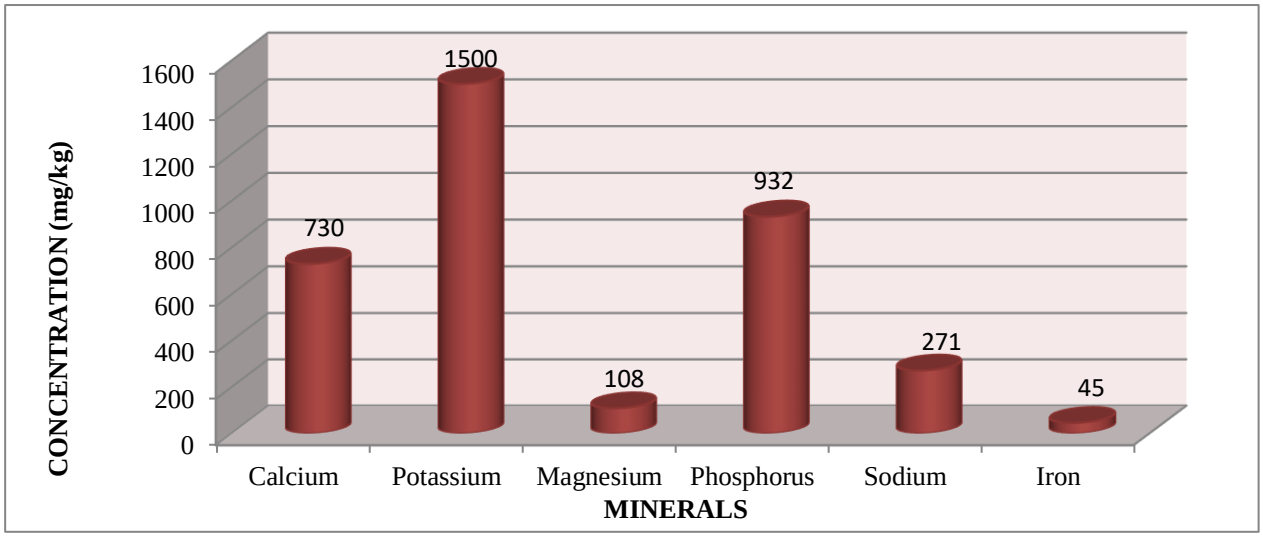

Figure 3: Representation of Mineral Content in Banana Peel

Phytochemical Analyses of Different Extracts, Extracted by Using Various Polar Solvents Were Carried Out.

Table 4 shows the phytochemical screening of banana peel. Four extracts were used which are methanol, ethanol, acetone and aqueous extract.

Table 4: Phytochemical Screening of the Extracts of Ripe Banana Peel Powder

Phytochemical	Methanol Extract	Ethanol Extract	Acetone Extract	Aqueous Extract
Flavonoids	+	+	+	+
Carbohydrates	+	+	+	+
Reducing Sugar	+	-	+	+
Tannins	+	+	-	+
Saponins	+	+	+	+
Anthraquinones	+	-	+	+
steroids	+	+	-	-
Alkaloids	+	-	+	-
Glycosides	+	+	+	-
Phytosterols	+	+	+	+
Terpenoids	+	+	+	+

Parameter- Aroma and Taste

Table 5: Individual Marking for Parameter 1 and 2

Members	Aroma/Smell (P1)		Taste (P2)	
	T1	T2	T1	T2
Member 1	7	8	6	7
Member2	7	6	7	7
Member 3	5	6	7	8
Member 4	7	6	6	8
Member 5	6	7	6	7
Member 6	7	5	7	8
Member 7	7	6	5	7
Member 8	6	7	6	7
Member 9	6	7	6	7
Member 10	6	8	7	8
Total	**64**	**66**	**63**	**74**
Average	**6.4**	**6.6**	**6.3**	**7.4**

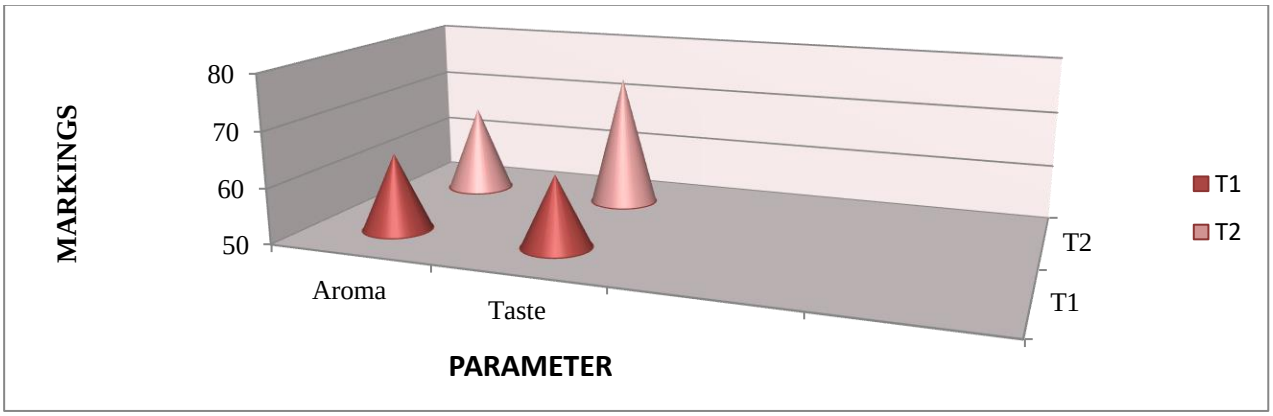

Figure 4: Graphical Representation of Parameter 1 and 2

The above graph shows that there is not much difference in aroma of both the samples while in terms of taste T2 was more

acceptable.

Parameter- Color and Overall Acceptability

Table 6: Individual Marking for Parameter 3 and 4

Members	Color (P3)		Overall Acceptability (P4)	
	T1	T2	T1	T2
Member 1	7	8	6	8
Member2	7	8	6	8
Member 3	4	6	5	6
Member 4	6	7	6	7
Member 5	6	7	6	7
Member 6	6	7	6	7
Member 7	7	8	7	8
Member 8	7	8	7	6
Member 9	6	7	5	6
Member 10	7	6	6	7
Total	**63**	**72**	**60**	77
Average	**6.3**	**7.2**	**6**	7.7

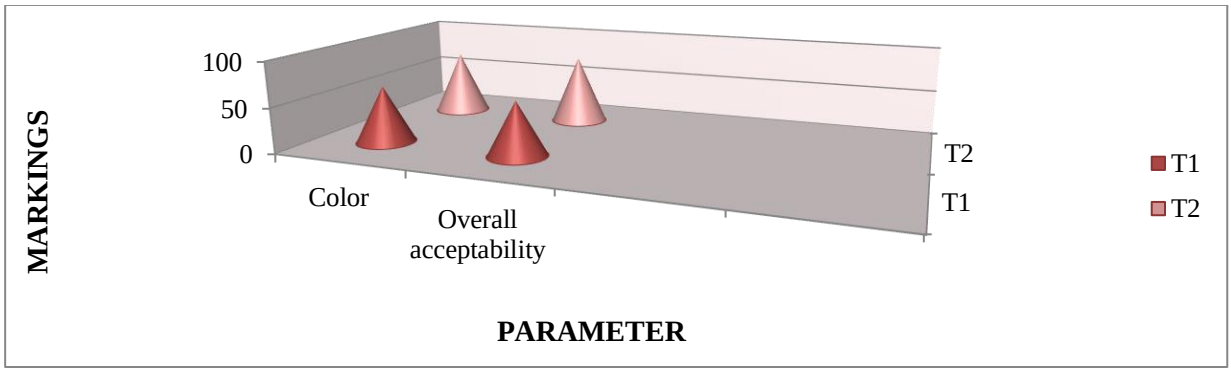

Figure 5: Graphical Representation of Parameter 3 and 4

The above graph shows the difference in color of both the infusion as T2 was darker in color due to the presence of banana peels.

Statistical Analysis

The above table shows total average and standard deviation for T1and T2. It is obtained by overall calculations of average marks obtained on the basis of each parameter. It shows that T2 is more acceptable by the community members.

Table 7: Statistical Analysis

Parameter	T1	T2
P1	64	66
P2	63	74
P3	63	72
P4	60	77
Total Sum	250	289
Average	62.5	72.25
S.D	1.73	4.64

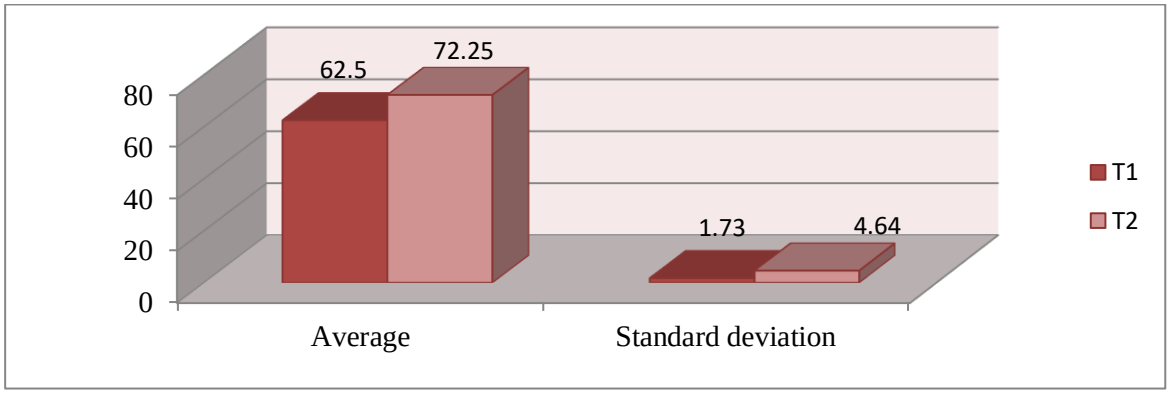

Figure 6: Graphical Representation of Average and Standard Deviation of T1 & T2

CONCLUSIONS

Ripe banana peel powder is an excellent way to improve the nutritional and physiological aspects of the final product. Based on the results, it can be concluded that it can be effectively used in food product formulation. The high content of fiber, minerals and other bioactive compounds indicates that peels are safe and healthy for consumption from nutritional point of view. The sample T2 was found more acceptable in sensory evaluation. The data in our analysis can therefore serve as the basis for future studies.

ACKNOWLEDGEMENT

I would like to express my sincere gratitude towards my advisor Prof. Sunita Mishra, Dean and Head, School for Home Science, BBAU, Lucknow for her continuous guidance and kind advice regarding this research work. I would also like to thank my parents for supporting and motivating me during this research work.

CONFLICTS OF INTEREST

There are no conflicts to declare.

REFERENCES

1. *Rodríguez-Ambriz SL, Islas-Hernández JJ, Agama-Acevedo E, Tovar J, Bello-Pérez LA. Characterization of a fibre-rich powder prepared by liquefaction of unripe banana flour. Food Chem. 2008;107:1515–21. htt p://dx.doi.org/10.1016/j.foodchem.2007.10.007*
2. *Alkarkhi AF, Ramli SB, Yong YS, Easa AM. Comparing physicochemical properties of banana pulp and peel fl ours prepared from green and ripe fruits. Food Chem. 2011;129:312– 8. htt p://dx.doi.org/10.1016/j.foodchem.2011.04.060*
3. *FAO (2017), "Banana facts", Food and Agriculture Organization of the United Nations, Rome, available at: www.fao.org/economic/est/est-commodities/bananas/bananafacts/en/*
4. *Qusti, S.Y., Abo-Khatwa, A.N. and Lahwa, M.A. (2010), "Free radical scavenger enzymes of fruit plant species cited in Holy Quran", World Applied Science Journal, Vol. 9 No. 3, pp. 338-344.*
5. *Kamble, P.B., Gawande, S. and Pati, T.S. (2017), "Extraction of pectin from unripe banana peel", International Research Journal of Engineering and Technology, Vol. 4 No. 7, pp. 2259-2264.*
6. *Shalini, R. and Gupta, D.K. (2010), "Utilization of pomace from apple processing industries: a review", Journal of Food*

Science and Technology, Vol. 47 No. 4, pp. 365-371.

7. *Rebello, L.P.G., Ramos, A.M., Pertuazatti, P.B., Barcia, M.T., Castillo-Munoz, N. and Hermosin-Gutierrez, I. (2014), "Flour of banana (Musa AAA) peel as a source of antioxidant phenolic compounds", Food Research International, Vol. 55, pp. 397-403.*
8. *Babiker, W.A.M., Sulieman, A.M.E., Elhardallou, S.B. and Khalifa, E.A. (2013), "Physicochemical properties of wheat bread supplemented with orange peel by-products", International Journal of Nutrition and Food Science, Vol. 2 No. 1, pp. 1-4.*
9. *Amarah, Umme., Chatra, Laxnikanth., Shenai, Prashanth., K, Veena., Prabhu, Rachana., and Kumar, Vagish., (2016). Miracle Plant- Tulsi. World Journal Of Pharmacy And Pharmaceutical Sciences,Vol.6, Issue 1, 1567-1581. ISSN 2278-4357.*
10. *Prosky L, Asp NG, Schweizer TF, Devries JW, Furda I. Determination of insoluble, soluble, and total dietary fi bre in foods and food products: interlaboratory study. J AOAC. 1988;71: 1017–23.*
11. *Goñi, I, Garcia-Alonso A, Saura-Calixto F. A starch hydrolysis procedure to estimate glycemic index. Nutr Res. 1997;17: 427–37. htt p://dx.doi.org/10.1016/S0271-5317(97)00010-9*
12. *Bunzel M, Ralph J, Marita J, Steinhart H. Identification of 4-O–5'-coupled diferulic acid from insoluble cereal fiber. J Agric Food Chem. 2000;48:3166–9. htt p://dx.doi.org/10.1021/jf000125n*
13. *Singleton VL, Rossi J. Colorimetry of total phenolics with phosphomolybdic phosphotungstic acid reagents. Am J Enol Vitic. 1965;16:144–53.*
14. *14.Yadav, R. N. S., & Agarwala, M. (2011).Phytochemical analysis of some medicinal plants. Journal of Phytology.*
15. *Soni, A., & Sosa, S. (2013). Phytochemical analysis and free radical scavenging potential of herbal and medicinal plant extracts. Journal of Pharmacognosy and Phytochemistry, 2(4), 22-29.*